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Color Doppler Evaluation of Scrotal Swellings

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Abstract

Aim: The present study was aimed to study the role of Colour Doppler ultrasonography in intra-scrotal swellings and to compare the findings of scrotal colour Doppler ultrasonography with clinical, surgical and histopathological findings where indicated.

Introduction: Scrotal swellings can present with acute pain or can be chronic non-painful swellings and swellings can be intra-testicular or extra-testicular. Color Doppler Sonography (CDS) is very valuable in differentiating intra-testicular and extra-testicular pathologies and also in differentiating acute painful conditions like inflammatory lesions and torsion, which helps in avoiding unnecessary surgical explorations and timely intervention in cases of tortion can save the testicles from infarction. Also color Doppler study of scrotum is more sensitive and specific for diagnosis of chronic lesions like hydrocele, epididymal cysts and varicocele than clinical palpation.

Observations: In the present study of 80 patients, the mean age of patients was 35.25 + 12.93 years. Maximum no. of patients were between 30 to 40 yrs. Clinically most common lesions were inflammatory lesions 20 cases (25%). On CDS examination, out of chronic painless swellings, epidydimal cysts were most common lesion. Extra-testicular lesions were more common than intra-testicular lesion. In intra-testicular lesions, testicular tumors were most common. Out of extra-testicular lesions, epididymal cysts were most common with 36 cases (45%). Hydrocele was second common lesion with 28 cases (35%). CDS was able to detect 100% of cases of tortion or inflammatory lesions accurately.

Results: CDS showed 100% sensitivity and 100% specificity in detecting testicular tortion as compared to clinical examination showing 100% and 91.89% respectively. CDS showed 100% sensitivity and 100% specificity in detecting inflammatory lesion as compared to clinical examination showing 75% and 96.4% respectively. US/CD was more sensitive in detecting chronic lesions like epidydimal cysts, varicocele, hydrocele etc.

Keywords: CDS (Colour Doppler Sonography), US(Ultrasound)

Introduction

Colour doppler examination of scrotum has been demonstrated to have significant impact on diagnosis of scrotal swellings. Scrotal swellings can be acute painful swellings like Testicular Torsion, Epididymo-orchitis, Testicular Trauma, Tortion of appendix testis, Strangulated hernia etc. or chronic swellings like Varicocele, Hydrocele, Inguinal Hernia, Testicular Tumors ,Epididymal Cysts, spermatocele, Intratesticular cysts etc.

The main indication for colour doppler ultrasound (which can reveal scrotal blood flow) is assessment of acute scrotal swelling especially in differential diagnosis of testicular torsion and epididymo-orchitis. The vast majority of patients who exhibit acute scrotal symptoms have non-surgical conditions, usually epididymitis or torsion of the appendix testis (Amerasekera, 2004). Surgical correction of tortion within 6 hrs of torsion will usually preserve testicular function. Colour doppler examination of torsion testes will show diminished or absent flow to testes with normal peritesticular flow in acute phase and persistence of decreased flow to testis with increased peritesticular flow in late phase (3-8 days, whereas epidydimitis will show increased flow with low resistance. High-resolution ultrasonography (US) is the firstline imaging modality for the evaluation of scrotal pathology (Kuhn et al 2016). Its ability to determine whether a scrotal mass is extra-testicular or intra-testicular is important, since the majority of extra-testicular lesions are benign while the majority of intra-testicular lesions are malignant. Additional use of colour Doppler ultrasonography (CDUS) enhances diagnostic accuracy (Muttarak and Chaiwun, 2005).

Aims and Objectives:

1. To determine the role of Colour Doppler ultrasonography in the evaluation of scrotal swellings.
2.To compare the findings of scrotal colour Doppler ultrasonography with clinical, surgical and histopathological findings where indicated.

Materials and Methods

This was a prospective study where patients with scrotal swelling, visiting the Department of Radiodiagnosis, Guru Nanak Dev Hospital were examined with colour Doppler ultrasonography using high frequency linear transducer having frequency of 3-12 MHz. A composite assessment of the patient's history, findings on physical examination and results obtained from scrotal colour Doppler were analyzed and a provisional diagnosis was made. After the sonography and CD examination, follow up of patients was done for operative findings or response to conservative treatment.

Inclusion criteria: Any male of any age presenting with scrotal swelling.

Observations

A total of 80 patients referred for scrotal ultrasound/colour Doppler examination by the Department of Surgery were included in the present study. On clinical examination the detection of lesion was as mentioned in table 1.

Table 1. Clinical examination findings

Disease	No. of Cases	%age
Hydrocele	6	7.5
Epi cyst	8	10
Varicocele	14	17.5
Inflammatory	20	25
Torsion	12	15
Tumor	4	5
Inguinal hernia	4	5
Other scrotal swellings	12	15
Total	80	100

Scrotal Ultrasound and Colour Doppler Findings

On conducting ultrasound and colour Doppler examination of 80 patients, total of 130 lesions were found. The table no.2 shows the distribution of lesions as follows:-

Table 2. CDS Examination

Disease	Left	Right	B/L	Total	%age
Hydrocele	6	10	12	28	35
Epi cyst	16	8	12	36	45
Varicocele	14	-	2	16	20
*Inflammatory lesion	14	10	-	24	30
Torsion	4	2	-	6	7.5
Tumor	2	2	-	4	5
Inguinal hernia	-	4	-	4	5
Haematorna	2	-	-	2	2.5
Spermatocele	-	2	-	2	2.5
**Others	2	4	2	8	10
Total	60	42	28	130	

* Epididymitis, epi-orchitis,pyocele,epiabecess,focal orchitis

** Scrotal skin odema, dilated rete testis, extratesticular pus collection

Table 3. Comparison of Clinical and Ultrasound/ Colour Doppler findings

Disease	Clinical findings		US/CD findings	
	No. of cases	%age	No. of cases	%age
Hydrocele	6	7.5	28	35
Epi cyst	8	10	36	45
Varicocele	14	17.5	16	20
Inflammatory lesion	20	25	24	30
Torsion	12	15	6	7.5
Tumor	4	5	4	5
Hernia	4	5	4	5
Others	12	15	12	15

Extra-testicular lesions were most common finding. Out of 6 intra-testicular only lesions, four were testicular tumors, two were dilated rete testis. A total of 12 patients presented with acute scrotal swelling were clinically suspected of having torsion of testis. On us/cd examination, only 6 were found to have torsion testis showing diminished or absent floe, rest 6 were found to have inflammatory lesion. A total of 20 patients who presented with acute scrotal swelling were clinically suspected of having inflammatory disease on us/cd examination, 18 patients were found to have inflammatory disease with increased flow, two case were found to have hydrocele with varicocele.

On clinical examination, total of 14 patients were found to have varicocele. All of these were subsequently found to have varicocele on us/cd examination also. us/cd diagnosed 16 cases of varicocele, out which two were not detected on clinical examination. Out of 16 cases, 14 cases had unilateral varicocele which was on left side in all cases. Two cases had b/l varicocele.

US/CD when compared to the clinical examination was found to have high sensitivity and specificity and high +PV and –PV. Out of 80 patients, total of 42 patients were operated for 72 lesions. 18 cases of epididymal cysts, 22 cases of hydrocele, 12 cases of varicocele, 6 cases of torsion, 4 cases of tumors, 4 cases of hernia, 2 case of haematoma were operated. 4 Cases of extra-testicular pus collection were operated. Findings on US/CD were confirmed in all cases on surgery.

Table 4 is showing sensitivity, specificity, positive predictive and negative predictive values of CD in diagnosis of testicular torsion

Of 12 patients suspected of having torsion on clinical examination, 6 cases were found to have torsion on CD examination which were confirmed on surgery. CD was found to have very high sensitivity, specificity, +PV and –PV for diagnosis of testicular torsion.

Table 4

Lesions		Surgical findings		Total
		+ve	-ve	
Colour doppper study	+ve	6	0	6
	-ve	0	74	74
	Total	6	74	80

Sensitivity = 100% Specificity= 100%
+PV= 100% -PV= 100%

Table 5 showing sensitivity, specificity, positive predictive and negative predictive values of CD in diagnosis of Inflammatory Lesions.

A total of 24 patients were diagnosed to have inflammatory lesions on CD. One patient was diagnosed to have epididymitis with testicular ischaemia, which was later on found to have testicular infarction. All other patients responded well to conservative treatment. CDS was found to have high sensitivity, specificity, +PV and –PV in diagnosis of inflammatory lesions.

Table 5

Lesions		Follow up after conservative treatment		Total
		+ve	-ve	
Colour doppper study	+ve	24	0	24
	-ve	0	56	56
	Total	24	56	80

Sensitivity = 100% Specificity= 100%
+PV= 100% -PV= 100%

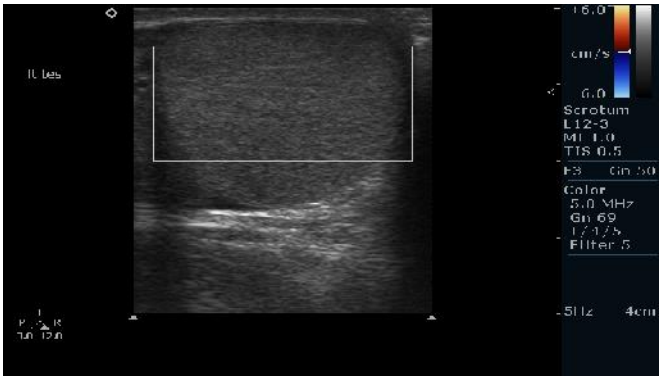

Fig 1. Case of tortion testes showing no flow on CD.

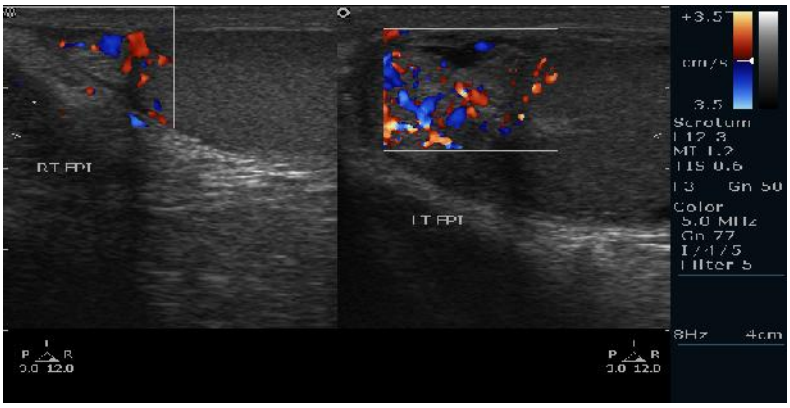

Fig 2. Case of left epidydimitis showing increased flow on CD.

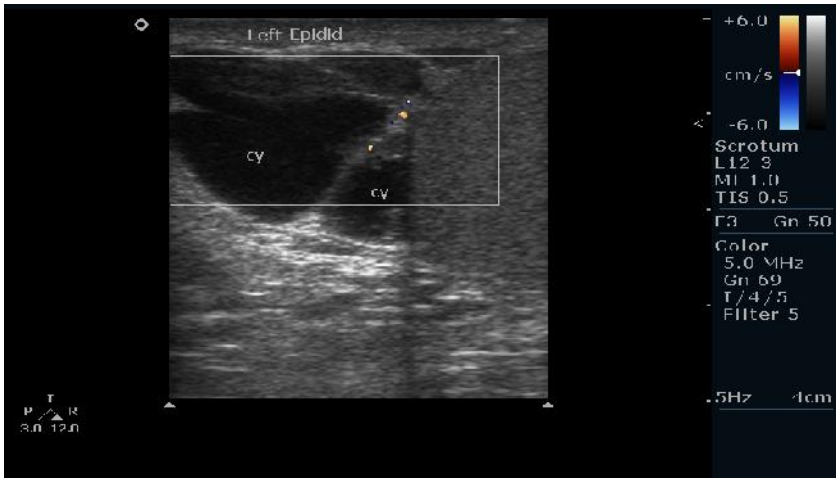

Fig 3. Case of left epidydimal cyst showing normal flow.

Discussion

80 Patients of any age presenting with scrotal swelling referred for ultarsonography by Department of Surgery were included in the study. The mean age of patients was 35.25 + 12.93 years. Maximum no. of patients were between 30 to 40 yrs.

In the present study, on local examination, the commonest abnormality detected clinically was Inflammatory disease (20 Cases, 25%). Unilateral varicocele was detected in 14 cases (17.5%). Torsion was suspected in 12 cases. Other findings included Epididymal cysts (8 Cases), Hydrocele

(6 cases), tumor (4 Cases), Inguinal hernia (4 Cases). Other non specific swellings were seen in 12 Cases.

In present study, on CDS examination of 80 patients, the most common lesions were extra-testicular only (72.5%), out of which epididymal cysts were most common with 36 cases (45%). Hydrocele was second common lesion with 28 cases (35%).

Hendrikx et al (1997) in their study of 215 consecutive patients with scrotal complaints found that hydrocele and varicocele were most common lesions with 46 cases (21.4%) of each. Micallef et al (2000) in their study of 582 patients found that most of scrotal swellings were extra testicular (75% of all scrotal swellings), hydrocele being the commonest. Out of the intra testicular causes, infection (50.8%) and tumor (20.6%) were commonest. In present study, 6 Cases (7.5%) had only intra testicular pathology, out of which four cases had testicular tumors. Two cases had dilated rete testis. Out of the combined intra and extra testicular lesions, inflammation was most common. Gupta et al (2017) found sonography to be 100% sensitive in detecting testicular tumors.

In the present study, on clinical examination 20 patients were found to have inflammatory lesions. Out of these 18 were confirmed on CDS which later responded well to conservative treatment. Two cases were found to have varicocele with hydrocele. Clinical examination diagnosed torsion testis in 12 cases. But after CDS examination and later on surgical exploration, only 6 cases were found to have testicular torsion, rest 6 cases were diagnosed to have inflammatory lesion on CDS, who responded to conservative treatment. Thus clinical examination diagnosed 6 (50%) true positive and 6 (50%) false positive cases of tortion.

Dogra et al (2003) stated that clinical differentiation of inflammation and torsion is difficult with a false positive rate of nearly 50% for diagnosis of testicular torsion based on clinical findings alone.

In the present study, Colour doppler was found to have 100% sensitivity, 100 specificity, 100% +PV and 100% -PV for diagnosis of testicular torsion.

Table 6 showing the comparison of present study with other studies for diagnosis of testicular torsion.

Table 6

Study	Sensitivity	Specificity	+PV	-PV
Weber et al (2000)	100%	-	73%	100%
Wilbert et al (1993)	82%	100%	-	-
Dell Atti et al (2005)	75%	87%	-	-
Paushter et al (2004)	86-100%	77-100%	-	-
Suzer et al (1997)	100%	100%	-	-
Dogra et al (2003)	86%	100%	-	-
Lam et al (2005)	69.2%	100%	100%	97.5%
Vijayaraghwan (2006)	100%	100%	-	-
Linda et al (2000)	88.9%	98.8%	-	-
Burks et al (1990)	86%	100%	-	-

Linda et al (2000) in their study of 130 patients, found Colour Doppler Sonography be 88.9% sensitive and 98.9% specific. They stated that nature of testicular torsion introduces diagnostic errors; in case of intermittent testicular torsion or lesser degrees of severity and duration of torsion, Doppler blood flow may be maintained which can give false negative results. Normal blood flow may not be detected in normal pre-pubertal testes which can be a source of false positive results.

Dogra et al (2003) used the absence of identifiable intra-testicular flow as the only criterion for detecting testicular torsion. Color Doppler US with Power Doppler was found to be 86% sensitive, 100 specific and 97% accurate in the diagnosis of torsion and ischaemia in painful scrotum. The high degree of accuracy is due to the superiority of Power Doppler US depiction of intra-testicular vessels compared with that of Color Doppler US in normal pre-pubertal testes.

Wilbert et al (1993) stated that in case of incomplete or early torsion, some residual perfusion may be detected in testis leading to false negative results.

In the present study, Colour Doppler Sonography was found to be have 100% sensitivity, 100% specificity, 100% + PV and 100% -PV for diagnosis of inflammatory lesions.

Table 7. showing comparison of present study with other studies for diagnosis of inflammatory lesions.

Table 7

	Sensitivity	Specificity	+PV	-PV
Present Study	100%	100%	100%	100%
Dogra et al (2003)	100%	-	-	-
Wilbert et al (1993)	70%	88%	-	-
Suzer et al (1997)	100%	100%	-	-

Dogra et al (2003) in their study stated that using the criterion of increased blood flow to the epididymis and testes, the sensitivity of Color Doppler US in detecting scrotal inflammation was nearly 100%. They also stated that analysis of the spectral waveform and resistive index can also provide useful information about inflammation of epididymis and testis. Horstman et al (1991) in their study of 45 patients of inflammatory disease found that in all cases, there was evidence of hyperemia: an increased number and concentration of detectable vessels was seen in affected portion and abnormally decreased vascular resistance was detected.

On clinical palpation, 8 patients out of 80 were found to have epididymal cysts, whereas on US/CD examination, 36 cases were found to have epididymal cysts. The low sensitivity of clinical examination for diagnosis of epididymal cysts as compared to US/CD examination may be due to the reason that in most cases of epididymal cysts diagnosed by US/CD, the epididymal cysts were incidental finding.

On clinical examination, 6 patients were found to have hydrocele where as on colour doppler sonography, 28 patients were found to have hydrocele. The low sensitivity of clinical examination for diagnosis of hydrocele may be due to the fact that small hydrocele was incidental finding.

In the present study, CDS diagnosed 16 cases of varicocele, out which 14 cases had unilateral varicocele, which were on left side in all cases. Two cases had B/L varicocele. Clinical palpation could detect unilateral varicocele in 14 cases only. All the cases detected by clinical examination were confirmed on CDS. All 16 of cases varicocele detected on CDS had venous diameter of more than 2 mm and showed increased flow was seen on valsalva maneuver.

Aydos et al (1993) studied 39 infertile men. Out of these 18 patients had clinically palpable varicocele and 21 patients were without clinically palpable varicocele. In patients with clinical varicocele, venous diameter of pampiniform plexus on US/CD examination was found to be more than 2mm, where as those without clinical varicocele were found to have diameter less than 1.8mm. But out of 21 cases without clinical varicocele, 13 were found to have reflux on CDS. They found CDS to be more sensitive for diagnosis of varicocele as compared to clinical palpation.

Out of total 80 patients, 42 patients with 72 lesions were operated. The findings on CDS were confirmed in all cases on surgery. No diagnosis was missed by CDS in present study.

Hendrikx et al (1997) in their study of 215 consecutive patients with scrotal complaints found that US and CDS missed five diagnoses.

In the present study, no diagnosis was missed by CDS in operated cases which may be because of small no. of operated cases.

Summary; The findings of present study are summarized as follows:

On clinical examination, most common finding was inflammatory disease (20 cases). Other findings included varicocele (14cases), Torsion (12 cases), Epididymal cysts (8 cases), Hydrocele (6 cases), Tumor (4 cases) Inguinal hernia (4 cases), other scrotal swelling (12 cases).

On Colour Doppler ,extra testicular lesions were most common finding (72.5%). Out of these epidydimal cysts were most common.

Out of 6 intra-testicular only lesions (7.5%), four were testicular tumors, two were dilated rete testis.Out of the combined intra and extra testicular lesions (20%), inflammation was most common.

On clinical examination 20 patients were found to have inflammatory lesions. Out of these 18 were confirmed on CDS who responded to conservative treatment. Thus clinical examination was found to have Sensitivity = 100%, Specificity = 91.89%, +PU=50% - PV = 100% for diagnosis of testicular torsion and Sensitivity = 75%, Specificity = 96.4%, +PU=90% - PV = 90% for diagnosis of inflammatory lesion.

On clinical palpation, 8 patients out of 80 were found to have epididymal cysts, whereas on CDS examination, 36 cases were found to have epididymal cysts. Thus clinical examination was found to have Sensitivity = 22.22%, Specificity = 100%, +PU=100% - PV = 61.1% for diagnosis of epididymal cysts.

On clinical examination, 6 patients were found to have hydrocele where as on Colour Doppler Sonography, 28 patients were found to have hydrocele. Thus clinical examination was found to have Sensitivity = 23.3%, Specificity = 100%, +PU=100% - PV = 70.2% for diagnosis of hydrocele.

In the present study, CDS diagnosed 16 cases of varicocele. Clinical palpation could detect unilateral varicocele in 14 cases only. Thus clinical examination was found to have Sensitivity = 87.5%, Specificity = 100%, +PU=100% - PV = 96.96% for diagnosis of varicocele.

Out of 12 patients suspected of having torsion on clinical examination, 6 cases were found to have torsion on CDS and were operated and findings of CDS were confirmed on surgery. Thus CDS was found to have Sensitivity = 100%, Specificity = 100%, +PU=100% - PV = 100% for diagnosis of torsion.

A total of 24 patients were diagnosed to have inflammatory lesions on CDS. All the patients were given conservative treatment and responded well to conservative treatment. CDS was found to have Sensitivity = 100%, Specificity = 100%, +PU=100% - PV = 100% for diagnosis of inflammatory lesions.

Out of total 80 patients, 42 patients with 72 lesions were operated. The findings on CDS were confirmed in all cases on surgery.

Conclusion

The present study concluded that Color Doppler Sonography is very valuable in diffentiating intratesticular and extratesticular pathologies and in diffentiating inflammatory lesions and torsion which helps in avoiding unnecessary surgical explorations. Also CDS is more sensitive and specific for diagnosis of lesions like hydrocele, epididymal cysts and varicocele than clinical palpation.

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References

1.Amerasekera D. Tesicular ultrasound. NHRG Ultrasound 2004; 23:48.

2.Aydos Y, Baltaci S, Salih M, Anafarta K, Beduk Y, Gulsoy U. Use of colour Doppler in evaluation of varicoceles. Eur Urol 1993; 24(2); 221-5.

3..Burks DD ,Markey BJ, Burkhard TK, Balsara ZN, Haluszka MM, Canning DA. Suspected testicular tortion and ischaemia: evaluation with colour Doppler sonography. Radiology 1990; 175:815-821.

4. Dell'Atti L , Fabiani A, Marconi A, Mantovani P, Muzzonigro G. reliability of echo-color-doppler in the differential diagnosis of the acute scrotum. Our experience. Arch Ital Urol Androl 2005; 77(1);66-8

5. Dogra VS, Gottlieb RH, Oka M, Rubens DJ. Sonography of the scrotum. Radiology 2003; 227:18-36

6.. Gupta AK, Srinuvasan S., Shetty SS., Chidambaram R. Int J Res Med Sci.2017 Apr;5(4):1499-1509

7..Hendrikx AJ,Dang CL, Vroeindeweij D, Korte JH. B-mode and colour flow duplex ultrasonography: a useful adjunct in diagnosing scrotal diseases; Br J Urol 1997;79(1):58-65

8..Horstman WG, Melson GL, Middleton WD, Andriole GL. Testicular tumors : findings with colour Doppler US. Radiology 1992; 185:733-737.

9.Kuhn AL, Scortegagna E, Nowitzki KM, Kim YH: Ultrasonography. 2016 Jul; 35(3):180-197.

10..Lam WW, Yap TL, Jacobsen AS, Teo HJ. Color Doppler ultrasonography replacing surgical exploration for acute scotum: myth or reality? Pediatr Radiol 2005;35(6):597-600.

11..Linda A. Baker, David Sigman, Ranjiv I. Mathews, Jane Benson, Steven G. Docimo; Pediatrics March 2000, VOLUME 105 / ISSUE(3): 604-607

12. Micallef M, Torreggiani WC, Hurley M, Dinsmore WW, Hogan B. The ultrasound investigation of scrotal swelling. Int J STD AIDS 2000 May; 11(5):297-302.

13..Muttarak M, Chaiwun B. Painless scrotal swelling: ultrasonographical features with pathological correlation. Singapore Med J 2005; 46(4):196.

14..Paushter D. Testicular torsion 2004. From http://www.emedicine.com/RADIO/topic 683.htm

15..Suzer O, Ozcan H, Kupeli S, Gheiler EL. Color Doppler imaging in the diagnosis of the acute scrotum. EUR Urol 1997;32(4):457-61.

16..Weber DM, Rosslein R, Fliegel C. color Doppler sonography in the diagnosis of acute scrotum in boys. Eur J Pediatr Surg 2000; 10(4):235-41

17..Wilbert DM, Schaerfe CW, Stern WD, Strohmaier WL, Bichler KH. Evaluation of the acute scotum by color-coded Doppler ultrasonograpy. J Urol 1993;149(6):1475-7.
18..Vijayaraghavan BS, Sonographic differential diagnosis of acute scrotum. J Ultrasound Med 2006;25;563-574

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